

FLEAS (SIPHONAPTERA) FROM ANCASH DEPARTMENT, PERU WITH
THE DESCRIPTION OF A NEW SPECIES, *ECTINORUS ALEJOI*
(RHOPALOPSYLLIDAE), AND THE DESCRIPTION OF THE MALE OF
PLOCOPSYLLA PALLAS (ROTHSCHILD, 1914) (STEPHANOCIRCIDAE)

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ABSTRACT

A collection of 358 fleas representing 6 families, 19 genera, and 21 species was made from eight species of mammals in seven provinces within Ancash Department, Peru. Specimens were also obtained from bank cavities and water flea traps. A new species of flea, *Ectinorus alejoi* (Rhopalopsyllidae) collected from *Lagidium peruana* Meyen, 1833 (vizcacha) is described from Recuay Province, bringing the total number of species belonging to the genus *Ectinorus* to 32. The male of *Plocopsylla pallas* (Rothschild, 1914) (Stephanocircidae) is also described for the first time. *Plocopsylla pallas* (16%), *Neotyphloceras crassispina hemisus* Rothschild, 1914 (14%), and *Cleopsylla townsendi* Jordan, 1936 (9%) comprised 39% of the total number of fleas collected. Three fleas are reported from Peru for the first time (*D. stejnegeri*, *P. achilles*, and *E. alejoi*). Eleven additional species represent new records for Ancash Department (*A. thurmani*, *C. townsendi*, *C. m. minerva*, *E. gallinacea*, *E. claviger*, *N. c. hemisus*, *P. pallas*, *P. d. quitanus*, *S. inca*, *T. bleptus*, and *T. titschacki*).

KEY WORDS: *Ectinorus alejoi*, *Ectinorus claviger*, *Plocopsylla pallas*, flea, Siphonaptera

INTRODUCTION

The flea fauna of South America is drastically understudied and Peru is no exception. Johnson's (1957) monographic work of the South American flea fauna comprises most of the known Peruvian records, which include 59 recognized taxa. Four additional Peruvian taxa were recorded by Hopkins and Rothschild (1966), ten by Smit (1970, 1976, 1978, and 1987), and three by Schramm and Lewis (1987, 1988), providing a total of 76 taxa. Our report provides a record of flea

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taxa recently collected in Ancash Department. Prior to this study, only 10 species (including cosmopolitan species) were recorded in Ancash Department. Miscellaneous fleas were opportunistically collected in September 1998 by Dr. Pat Carney, Uniformed Services University of the Health Sciences (USUHA) during biomedical research studies. They were also collected during a medical entomology training program conducted 2–6 September 1999 by personnel of USUHS, Bethesda, MD in cooperation with the Ministerio de Salud, Hospital de Caraz (USUHS Team). Following the 1999 training program, medical technologists from several provincial hospitals also submitted fleas. During 23–30 March 2000 hantavirus studies were conducted (Hastriter Team) and fleas and tissue samples were collected (results of the hantavirus investigations are published elsewhere). Among our material are a new species of *Ectinorus* Jordan, 1942 (Rhopalopsyllidae) and the undescribed male of *Plocopsylla pallas* (Rothschild, 1914) (Stephanocircidae). A review of the genus *Ectinorus* was provided in Hastriter (2001). The description of one additional species of *Ectinorus* brings the total number of species in this genus to 32. This paper presents and discusses several new records for Ancash Department and examines the current species known to occur in Peru to include three new records for the country.

MATERIALS AND METHODS

During the September 1998 collections and those made during the September 1999 training program, collection activities were confined to agricultural areas along the Santa River near Choquechaca (Hauzlas Province). Vegetation included bamboo thickets in wet areas along the river, and *Agave* sp. and numerous varieties of cacti along the valley floor away from the river. Special emphasis was placed on trapping in and around human dwellings and along rock fences extending through fields (elevation: 2100–2200 m). Habitats selected during the flea and hantavirus research study (March 2000) included the following: 1) Chiquian Province (3600–4000 m)—High elevation grassland known as “puna” consisting of large fescue (*Festuca orthophylla* Pilger, 1898) and needle grass (*Stipa ichu* Kunth, 1829). 2) Huaraz Province (1800–3700 m)—steep rocky slopes with low growing vegetation. 3) Huaylas Province (3300–3700 m)—Parque Nacional Huascarán was characterized by steep rocky slopes, heavily vegetated with low growing shrubs. Region was small plot agriculture and sheep grazing. 4) Recuay Province (3600–4400 m)—the lower elevations were over-grazed by sheep and the upper regions were abundantly covered with *F. orthophylla* and *S. ichu* and small scattered boulders. Habitats in Pomabamba and Huari Provinces were not observed by the authors.

Standard aluminum collapsible Sherman traps baited with oatmeal or oatmeal and peanut butter were used to trap small mammals. Trapped mammals were shaken into cloth or plastic bags at each capture site and transported to a field processing location. Each animal was brushed briskly with a toothbrush over a white bucket to capture the fleas. Fleas were placed in 80% ethanol, returned to the laboratory and prepared by soaking in 10% KOH for a period (~24 hours), dehydrated in serial alcohols (70, 80, 95 and 100%, a minimum of 30 minutes each), cleared in methyl salicylate (maximum of 20 minutes), and xylene (minimum of one hour). Fleas were mounted on glass microscope slides in Canada balsam using 12 mm cover-slips (#1 thickness). Mammals were euthanized by cervical dislocation. Each was weighed, measured, preserved in 10% formalin,

and later identified. Miscellaneous fleas were collected by hand-picking nesting materials or substrates from earthen bank nest cavities. Water flea traps were used to capture fleas in human dwellings. Traps were comprised of a shallow plastic pan (2.5 cm deep \times 45 cm wide) with a kerosene-wicked can set in the middle. Water was added to the pan and the wick lighted. Fleas attracted to the burning lantern were captured in the mote of water. Unless otherwise noted, all specimens were collected in Ancash Department, Peru.

Total body lengths of males and females were measured from the foremost portion of the frons to the apex of the st. VIII in males and to the posterior border of the sensillial plate in females. The measurement of each sex is expressed as the means of the composite number of specimens measured. Illustrations were prepared with the aid of a camera lucida mounted on a Zeiss compound microscope. With exception of the term *processus basimeris ventralis* adopted from Smit (1987), the terminology of flea structures follows those of Rothschild and Traub (1971).

RESULTS

Ceratophyllidae

Dasypsyllus stejnegeri (Jordan, 1937)

Specimens Examined.—**Recuay Province:** 19 km W Recuay (9°44'6"S, 77°30'3"W), 4420 m, ex "soil from nest cavity" of *Colaptes rupicola* Orbigny, 1840 (= Andean flicker) in earth bank, 29 March 2000, Hastriter Team, 3 ♀; and road cut on highway 109 between Chiquian junction and Pavilica (10°9'36"S, 77°19'43"W), 3980 m, ex *C. rupicola* nest cavity in vertical road cut, 1 April 2000, M. W. Hastriter and R. Soto, 1 ♂.

Remarks.—This flea is distributed from the Bering Straits of Alaska to the southern tip of South America on a wide variety of avian hosts, particularly Passerine land-birds (Smit, 1961). This is the first record of its occurrence in Peru and on a species of *Colaptes*. Since little is known about the bionomics of this flea, it seems prudent to record our observations during its collection. The adult host bird was seen exiting the earth nest cavity (opening: ~18 cm diameter, depth: ~60 cm) on several occasions. A ladder was acquired to access the nest 3.25 m above the ground. Five hatchlings were present and fleas were not noted on them. Approximately one liter of dry, coarse sand was removed from the earthen nest cavity and was protected from the sun until examined. Each of the three female fleas was rather inactive, failing to crawl or jump when probed; however, each became very agitated when placed in alcohol. In comparison, the single male removed from the nest cavity in the road cut along highway 109 was collected from very fine moist soil. There were multiple holes in the road cut that were made by *C. rupicola*, but few were accessible. It should be noted that the localities of the two collection sites (within the same province) were separated by more than 70 km. This would suggest that this flea is established and that *C. rupicola* may be a significant host species throughout high elevations in the South American Andes. Smit (1961) suggested that long-range flying sea birds are responsible for the wide distribution of this flea. This does not seem plausible as there is little association between Passerine birds and sea birds and the species has never been collected from sea birds. Our finding of this species in Peru has great significance in demonstrating an established population between previously disjunct populations in northwestern South America and the Falkland Islands. Its presence in

central Peru supports the theory of distribution by "leap-frogging" by migrating Passerine land birds as proposed by Traub, Rothschild, and Haddow (1983).

Plusaetis dolens quitanus (Jordan, 1931)

Specimens Examined.—**Huaraz Province:** Pariacota (9°33'10"S, 77°35'69"W), ex *Phyllotis andium* Thomas, 1912, 24 March 2000, Hastriter Team, 2♂, 1♀. **Huaylas Province:** Parque Nacional Huascarán (9°30'40"S, 77°28'32"W), 3385 m, ex *Phyllotis amicus* Thomas, 1900, 25 March 2000, Hastriter Team, 2♂, 1♀; Parque Nacional Huascarán (9°30'24"S, 77°27'69"W), 3475 m, ex *P. andium*, 25 March 2000, Hastriter Team, 2♀; Parque Nacional Huascarán (9°30'40"S, 77°28'32"W), 3385 m, ex *Akodon* sp2 cf. *mollis*, 25 March 2000, Hastriter Team, 2♂. **Pomabamba Province:** Huayllan, ex *Mus musculus* Linnaeus, 1758, 17 February 2000, A Lopez, 1♂. **Recuay Province:** 4.6 km W Recuay (9°43'36"S, 77°27'917"W), ~3660 m, ex *Akodon* sp1 cf. *mollis*, 29 March 2000, Hastriter Team, 3♀; 4.6 km W Recuay (9°43'36"S, 77°27'55"W), ~3660 m, ex *P. andium*, 29 March 2000, Hastriter Team, 2♀.

Remarks.—The lateral aspect of t. VIII of males bears an anterior vertical row of two setae and a vertical row of three just posterior to these. The telomere is distinctly rounded along caudal margin opposed to that of *P. equatoris* (Jordan, 1933).

These records represent the most southern distribution of *P. d. quitanus*. Johnson (1957) elaborated on the distribution of earlier records approximately three degrees north in Huancabamba Province, Department of Piura, Peru and material from Ecuador (the type locality for the subspecies). It should be noted that Macchiavello (1948) alluded to *P. equatoris* as an important vector of plague in rural areas of northern Peru, but his specimens probably were *P. d. quitanus*.

Ctenophthalmidae

Neotyphloceras crassispina hemisus Jordan, 1936

Specimens Examined.—**Chiquian Province:** E of Chiquian, (10°9'54"S, 77°19'42"W), 3900 m, ex *Akodon* sp1 cf. *mollis*, 27 March 2000, Hastriter Team, 1♀; E of Chiquian, (10°06'07"S, 77°11'07"W), 4190 m, 27 March 2000, Hastriter Team, 1♀; E of Chiquian, (10°08'06"S, 77°10'22"W), ~3660 m, 27 March 2000, Hastriter Team, 1♀. **Hauzlas Province:** Santa River Valley, Choquechaca (N of Caraz), 2195 m, ex *Oryzomys xanthaeolus* Thomas, 1894, 3–4 September 1999, USUHS Team, 4♂, 5♀; ex *Thomasomys* sp., 4 September 1999, USUHS Team, 1♂, 2♀; ex *P. andium*, 2 September 1999, USUHS Team, 2♂, 7♀; ex *Akodon mollis* Thomas, 1894, 3–4 September 1999, USUHS Team, 1♂, 1♀; ex *O. xanthaeolus*, 27 September 1998, P. Carney, 1♀; ex *A. mollis*, 25 September 1998, P. Carney, 1♀; 9 km N Caraz (9°00'12"S, 77°49'36"W), 2440 m, ex *P. andium*, 30 March 2000, Hastriter Team, 5♂, 3♀. **Huaraz Province:** Pariacota (9°33'27"S, 77°38'82"W), 3630 m, ex *P. andium*, 24 March 2000, Hastriter Team, 1♂, 3♀; Pariacota (9°33'10"S, 77°35'69"W), 3715 m, ex *P. andium*, 24 March 2000, Hastriter Team, 1♀. **Huaylas Province:** Parque Nacional Huascarán (9°30'04"S, 77°25'31"W), 3630 m, ex *Akodon* sp1 cf. *mollis*, 25 March 2000, Hastriter Team, 1♂. **Recuay Province:** 10 km W Recuay (9°43'25"S, 77°29'13"W), 4010 m, ex *P. andium*, 29 March 2000, Hastriter Team, 1♂, 1♀; 19 km W Recuay (9°44'06"S, 77°30'03"W), 4420 m, ex *Akodon* sp1 cf. *mollis*, 29 March 2000, Hastriter Team, 2♀; N of highway 109 between Chiquian junction and Pavilitica (10°9'14"S, 77°19'17"W), 3990 m, ex *P. andium*, 28 March 2000, Hastriter Team, 3♀.

Remarks.—This ubiquitous species is found on a variety of hosts throughout its range and occurred at low (2195 m) and high (4420 m) elevations in all areas sampled in Ancash Department. The apex of the basimere has been used as the major feature to distinguish between the various subspecies of *Neotyphloceras*. This character is variable and unreliable. Males of this subspecies may readily be distinguished from *N. c. chilensis* Jordan, 1936, and *N. rosenbergi* (Rothschild, 1904) by the presence of spicules adorning the surface of the anterior sclerite connecting the left and right basimeres. These structures become visible when

focusing beyond the outer surface of the base of the basimere. They are also present in specimens of *N. c. crassispina* Rothschild, 1914 from Concepción, Chile. *Neotyphloceras c. hemisus* may be a synonym of the nominate subspecies, but the genus requires a comprehensive study for a definitive conclusion.

Leptopsyllidae

Leptopsylla segnis (Schönherr, 1811)

Specimens Examined.—**Hauzlas Province:** Santa River Valley, Choquechaca (N of Caraz), 2195 m: ex *M. musculus*, 2 September 1999, USUHS Team, 1♀; ex *M. musculus*, 4 September 1999, USUHS Team, 4♂, 6♀. **Pomabamba Province:** Huayllan, ex *M. musculus*, 17 February 2000, A. Lopez, 5♂, 5♀.

Pulicidae

Ctenocephalides felis felis (Bouché, 1835)

Specimens Examined.—**Hauzlas Province:** Santa River Valley, Choquechaca (N of Caraz), 2195 m, ex domestic dog, 5 September 1999, USUHS Team.

Remarks.—Hundreds of *C. f. felis* were hand-picked from domestic dogs by the students during the training program and countless others were trapped with water flea traps. An account of the number of specimens was not maintained.

Echidnophaga gallinacea (Westwood, 1875)

Specimens Examined.—**Hauzlas Province:** Santa River Valley, Choquechaca (N of Caraz), 2195 m, water flea trap, 3 September 1999, USUHS Team, 3♂, 2♀.

Remarks.—It is interesting that these stick-tight fleas were actively ambulatory and possibly attracted to the light of the water flea traps.

Hectopsylla suarezi C. Fox, 1929

Specimens Examined.—**Huari Province:** Progreso, ex *Cavia porcellus* (Linnaeus, 1758), 14 April 1999, D. Jodulhe, 1♀.

Remarks.—Most common hosts include caviid rodents, *C. porcellus* and *Cavia aperea* Erxleben, 1777. Hückinghaus (1961) considered *C. porcellus* as a synonym of *C. aperea*. This flea may support that conclusion, since it parasitizes both taxa and peridomestic rodents associated with these caviids. Although this flea is not often collected, its broad distribution is probably attributed to the common transport and trade of *C. porcellus* throughout the Andes.

Pulex irritans Linnaeus, 1758

Specimens Examined.—**Hauzlas Province:** Santa River Valley, Choquechaca (N of Caraz), 2195 m, water flea trap, 3 September 1999, USUHS Team, 3♂, 1♀.

Remarks.—Johnson (1957) recognized only *P. irritans* in South America, whereas Smit (1958) provided morphological justification that both *P. irritans* and *P. simulans* Baker, 1895 occur in North America. The senior author has examined material from localities adjacent to Lima (not reported in this study) which includes specimens comparable to North American *P. simulans*. Species belonging to *Pulex* are common around human habitations throughout Peru and

have been implicated in plague transmission in the highlands of northcentral Peru, particularly in the high Andean valleys in the Department of Cajamarca. Detailed studies of large series of this genus from diverse areas in South America are needed to determine if the complex is comprised of *P. irritans*, *P. simulans*, and possibly undescribed species, as alluded to by Smit (1958).

Tunga penetrans Linnaeus, 1758

Specimens Examined.—**Hauzlas Province:** Santa River Valley, Yuracota, (near brick making bat cave, N of Caraz), 2225 m, ex domestic dog, 20 March 2000, P. Lima, 1♂, 1♀. **Pomabamba Province:** Pomabamba, “in abandoned house,” 9 January 1999, J. Valverde, 4♂, 6♀.

Rhopalopsyllidae

Ayshaepsylla thurmani (Johnson, 1957)

Specimens Examined.—**Huaraz Province:** (9°32'32"S, 77°47'50"W), 1860 m, ex *P. andium*, 23 March 2000, Hastriter Team, 1♀.

Remarks.—*Ayshaepsylla* was erected as a subgenus of *Polygenis* by Smit (1987) and later elevated to genus by Linardi and Guimarães (1993). Accordingly, the genus *Ayshaepsylla* is distinct from all other genera within the subfamily Rhopalopsyllinae by the vestigial nature of the posterodorsal extension of the metasternal furca that does not extend more than one-half the length of the metapleural ridge. Smit (1987) incorrectly changed the spelling to “thurmanni” in all reference to this species. To avoid future perpetuation of this error, the correct species designation is *A. thurmani*, after Deed C. Thurman, Jr. (Johnson, 1957).

Several features of our female differ from those of *A. thurmani* illustrated by Johnson (1957). The dorsal lobe along the caudal margin of st. VII is longer and more acute and the subtending sinus much deeper. Sternum VII has 5 setae per side instead of 4 and the ventral margin of the spermatheca is angular rather than smoothly concave. Johnson (1957) reports the length of the allotype as 3.0 mm, whereas our specimen is about half that length (1.6 mm). Based on these variations, our specimen may prove to be a new species; however, a series to include accompanying males is needed to evaluate this taxon.

This rarely-collected flea has been reported only from two disjunct localities in southwestern Colombia (8♂, 7♀) and southern Peru (4♂, 6♀). Since our new record lies about half way between these localities, additional collecting will probably yield additional specimens throughout intermediate elevations (1465–1920 m) in Peru and Ecuador. Data are insufficient to establish host preferences for this species; however, Linardi and Guimarães (1993) consider Cricetine rodents to be the primary hosts.

Ectinorus (Ectinorus) alejoi Hastriter, **new species**
(Fig. 1A–H, 2A)

Type Material.—**Recuay Province:** W of highway junction 3 and 109 (~10°03'S, 77°22'W), ~4115 m, ex *Lagidium peruanum* Meyen, 1833, 29 March 2000, T. Alejo, 12♂, 2♀. The holotype, allotype, and 5 paratypes (5♂) are deposited in the Carnegie Museum of Natural History (CMNH), Pittsburgh, Pennsylvania, and 7 paratypes (6♂, 1♀) are deposited in the senior author's collection.

Diagnosis.—For those species that have no marginal spinelets on t. I, it most closely resembles *E. viscachae* (Wagner, 1937) in the male by details of the clasp-



Fig. 1.—*Ectinorus alejoi* n. sp. A. Male clasper (basimere and telomere), holotype. B. Male ninth sternites, (L=left side, R=right side). C. Male eighth sternum, paratype. D. Apex of aedeagus, retracted, paratype. E. Apex of aedeagus, protracted, holotype. F. Female seventh sternum, allotype. G. Bursa copulatrix, allotype. H. Spermatheca, allotype. *Ectinorus claviger*. I. Bursa copulatrix. J. Female seventh sternum. Scale = 100 μ .

er, st. VIII, and st. IX and in the female by the modified abdominal segments and the shape of the spermatheca. It may be distinguished in the male by the presence of a processus basimeris ventralis (Fig. 1A), the caudal margin of the telomere is convex throughout and the apex is only slightly broader than body of telomere, an extended lobe (heel) is absent at the juncture of the proximal and distal arms of st. IX, and the posterior apical margin of st. IX has only 3–4 stout setae (Fig. 1B). Females may be separated from *E. viscachae* by the presence of an isolated lateral patch of 5–6 small setae on st. II (*E. viscachae* has a patch of many setae merging with the ventral setae) and the perula of bursa copulatrix is strongly reflexed and globular (Fig. 1G). Females also differ from those of *Ectinorus claviger* (Rothschild, 1914) by the presence of more than 20 trichobothria on the sensillum.

Description.—Head, male holotype (Fig. 2A): Frontal tubercle close to oral angle by less than its

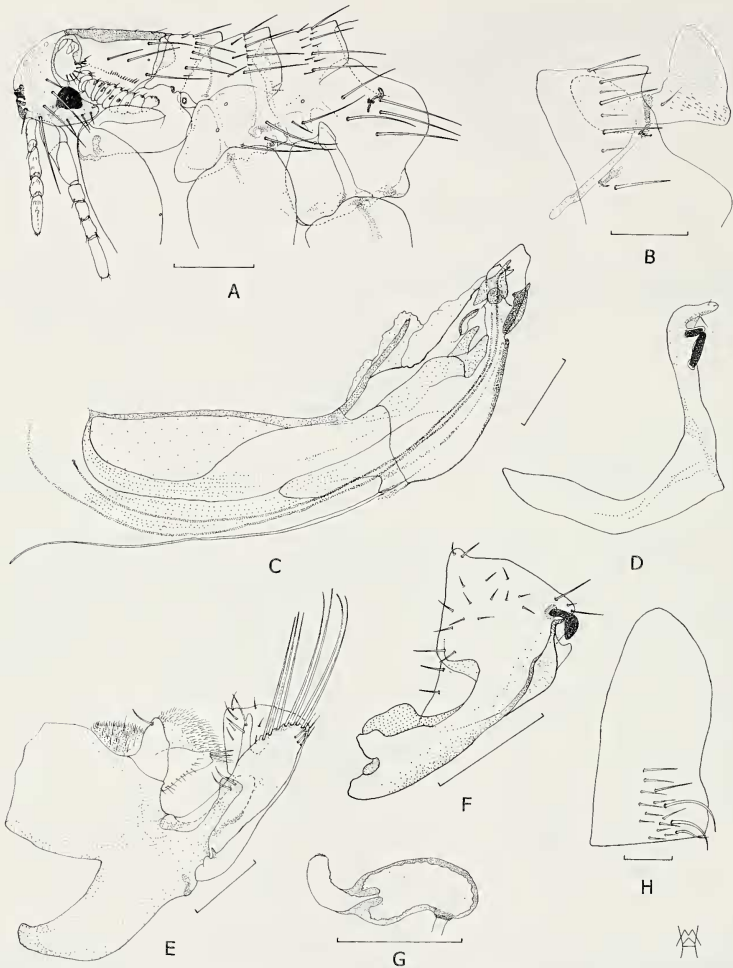


Fig. 2.—*Ectinorus alejoi* n. sp. A. Head and thorax, holotype. *Plocopsylla pallas*. B. Male seventh and eighth tergites. C. Aedeagus. D. Male ninth sternum. E. Male clasper (basimere and telomere). F. Enlargement of telomere, mesal view. G. Spermatheca. H. Female seventh sternum. Scale = 100 μ .

vertical width. Two placoid pits along frontal margin. Ocular setae 3, with single seta anterior to eye (single seta lacking in female). Eye large and darkly pigmented with sclerotized ridge extending to margin of gena associated with visible arch of tentorium. Three setae along lower margin of genal lobe and 2 minute setae at apex. Postantennal area with 3 rows of setae per side (1, 1, 5), intercalaries in posterior row. Occipital groove as deep as width of first maxillary palpus. Third segment of maxillary palpus only half length of other segments. Labial palpus of 5 segments extending to apex of fore coxae, each of the 3 middle segments less than half the length of either segment 1 or 5; maxillae sharply pointed apically. Antennal fossa bordered above by row of 21–22 minute setae. Scape with apical fringe of 7 setae, pedicel with 2 very short setae, and clavus long, extending well onto prosternosome. Thorax (Fig. 2A): notal segments each with 2 rows of setae (anterior row of pronotum of only 2 dorsal setae per side). Mesonotal collar with 6–7 pseudosetae per side (variable in number in some paratypes). Mesopleuron with 5 setae; mesosternum vestigial. Lateral metanotal area with 2 setae (1 large, 1 small). Pleural arch well developed. Metepisternum with single seta. Dorsal margin of metasternum inconspicuous, ventral lobe not extending downward. Metepimeron with anterior vertical row of 2 setae and posterior row of 3 setae, all below level of the foot-shaped spiracular atrium. Legs: Fore coxa with 18–20 lateral setae, mid and hind coxae with numerous setae on mesal surface of

anterior margins and lateral sulcus of mid coxa at most indicated by notch at posterior apical margin. Pair of setae guarding femoral-tibial joint of fore femur about equal in length, lateral setae shorter of pair on mid and hind femora. A single seta present over femoral pit. Surface sculpturing absent on all femora. Mid and hind femora each with single lateral row of 5–6 setae. Tibiae each with 6 dorsal notches and each with corresponding vertical row of 5–6 setae (female with 7 dorsal notches on hind femur). Second segment of fore tarsus longer than each of segments 1, 3, and 4. Two apical bristles of second segment of hind tarsus extending well beyond base of distitarsomere. Four lateral plantar bristles on each segment, 2 preapical plantar bristles of fore and mid distitarsomeres spiniform but less so on hind distitarsomere (1 spiniform and 1 hair-like seta on all distitarsomeres of female). Unmodified Abdominal Segments: Tergum I with 2 rows of setae, anterior comprised of 1–2 setae per side, t. II–VII each with single row of setae with intercalaries (female with 2 rows on each tergite). Each row with one seta below level of very small spiracles (female has 1 or 3 below level of each spiracle). Single marginal antensensilial bristle borne on tubercle. Lateral patch of 2–4 setae on st. II and single seta per side on main row (female with lateral patch of 5–6 setae and 3 per side in main row); st. III–VII each with 2–3 setae per side (female with two rows of 4–5 setae per side on st. III–IV, two rows of 1 and 5 setae per side on st. V–VII). Modified Abdominal Segments, male (Fig. 1A–C): Tergum VIII reduced, without setae. Sensillum with 24–26 trichobothria per side. Manubrium of t. IX narrow, parallel-sided, and turned upward at apex. Basimere nearly square with processus basimeris ventralis (see remarks) at ventral-caudal margin bearing 2 apical setae. Acetabular bristle single; numerous long setae along periphery of basimere. Telomere slightly extending beyond basimere, parallel-sided, and slightly convex along posterior margin (Fig. 1A). Sternum VIII bilobed, with lateral lobe bluntly rounded and medial lobe acutely pointed; lateral portion with 5–6 setae (Fig. 1C). Distal lobe of st. IX club-shaped; lobe of each side asymmetrical. The right distal arm bears a sclerotized tooth on mesal side of apex not present on left side (Fig. 1B). Caudal margin with 4 slender setae and lateral area with scattered setae. Sternum IX lacks tendon. Aedeagus (Fig. 1D–E): Aedeagal apodeme broadly spatulate, bluntly rounded at apex, and with narrow neck preceding fulcral medial and lateral lobes. Penis rods extend around apex of aedeagal apodeme. Orifice of sclerotized inner tube oblique in lateral view; ringed at basal $\frac{1}{2}$. Median dorsal lobe hooked apically with short blunt disto-lateral lobes. Alpha portion of Ford's sclerite "C"-shaped, heavily sclerotized. Securifer of Ford's sclerite claw-like with small tooth on anterior margin. Crochet sclerotized and rod-like. Paired ventral lobes narrow and hook-like. Modified Abdominal Segments, female (Fig. 1F–H): Tergum VIII with 4 setae above spiracle, lateral curved row of 5 long setae and 12 scattered lateral setae. Dorsal caudal lobe of t. VIII conical with group of many setae both mesally and laterally. Conical lobe subtended by broad sinus with 4 evenly spaced marginal setae. Caudal margin of st. VII with rounded lobe; 5–6 lateral setae per side and anterior group of 5–6 smaller setae (Fig. 1F). Sternum VIII broad, apically rounded lobe without setae. Bursa copulatrix sclerotized anteriorly, strongly reflexed caudally; perula globular (Fig. 1G). Bulga of spermatheca nearly spherical; duct emerging at apex. Hilla nearly twice length of bulga; slightly wider distally than proximally. Cribriform area expanded over half of bulga (Fig. 1H).

Length (slide mounted specimens).—Male: 2.0 mm (n=7, range=1.9–2.2 mm); Female: 2.9 mm (n=2, range=2.7–3.0 mm).

Etymology.—This species is named after the collector, Teophilo Alejo, a local hunter and respected conservationist in Recuay Province.

Remarks.—Specimens of *E. alejoi* collected from a single host animal were found in association with a series of *T. titschacki*. The rarity of *T. titschacki* in collections may be a reflection of the infrequent examination of its preferred host, *L. peruanum*. It is predictable that *E. alejoi* occurs throughout the narrow high elevation range of this chinchillid rodent, just as that of *T. titschacki*.

The use of the term processus basimeris ventralis in the key provided by Smit (1987) describing some taxa within the genus *Ectinorus* may be misleading and requires some explanation. As the term would imply, it includes a process that arises from the basimere on its ventral margin. Among those species considered to have a processus basimeris ventralis, the position of the process on the basimere varies considerably from an extreme ventral position forming a deep cleft, or sinus between the basimere and the process [*E. claviger*, *E. budini* (Jordan and Rothschild, 1923), etc.] to a more caudal position that includes a process without

the presence of a cleft, or sinus (*E. ineptus* Johnson, 1957, *E. sentus*, and *E. uncinatus* Beaucournu and Gallardo, 1991). Nonetheless, any process along the ventral or caudal margin of the basimere should be considered the processus basimeris ventralis.

Ectinorus (Ectinorus) claviger (Rothschild, 1914)
(Fig. 11–J)

Specimens Examined.—**Recuay Province:** W of highway junction 3 and 109 (~10°03'S, 77°22'W), ~4115 m, *L. peruanum*, 29 March 2000, T. Alejo, 1♀. This specimen is deposited in the Carnegie Museum of Natural History.

Remarks.—This female was collected from the same host species as *E. alejo* (described above). A very closely related species (if not conspecific), *Ectinorus sentus* (Rothschild, 1914) was also reported from vizcacha (*Lagidium* Meyen, 1833 or *Lagostomus* Brookes, 1828) from the adjacent province of Junin. Wilson and Reeder (1993) indicates that the monotypic genus *Lagostomus* does not occur in Peru. Consequently, the Junin record was assuredly also from *L. peruanum*. Neither *E. claviger* nor *E. sentus* possess marginal spinelets on t. I, and the sensillum of each has fewer than 20 trichobothria per side. The latter character separates them from the closely allied taxon, *E. viscachae* (Wagner, 1937). Females of *E. sentus* are unknown. Our female was compared with the female description of *E. claviger* provided by Wagner (1937) and found to be conspecific. The female is unknown for three additional species within this group [*E. budini* (Jordan and Rothschild, 1923), *E. nomisis* Smit, 1987, and *E. pearsoni* (Johnson, 1957)], but their distributions are extralimital. Smit (1987), in couplet 19 of his key to the species of the subgenus *Ectinorus*, overlooked the description of *E. claviger* females by Wagner (1937). A brief description of the female of *E. claviger* is provided to supplement that of Wagner (1937).

Description.—**Head:** Frontal tubercle well developed. Ocular row of 3 setae, ventral seta the larger. Labial palpus of 5 segments, extending to middle of trochanter. Genal lobe with marginal ventral row of 5 small setae. Eye with deep ventral sinus. Occipital area with single minute seta dorsal to antennal fossa and 3 setae per side along posterior main row. Scape with 5 marginal setae, pedicel with dorsal lobe bearing several small setae and a single seta extending about ½ length of antenna. **Thorax:** Pronotum with single row of setae, mesonotum with two rows of setae and 17–18 pseudosetae under mesonotal collar, metanotum with two rows of setae. Dorsal portion of prosternum arched upward forming depression and shield for terminal segments of antenna. Meso- and metasterna not extending downward. Furca hair-like and pleural arch well developed. Metepimeron with single vertical row of 4 setae and single seta anterior to row. **Legs:** Mid coxa with lateral sulcus incomplete. Hind coxa with fringe of setae mesally from base to apex. Lateral setae guarding femoral-tibial joint shortest on fore femur and longest on mid and hind femora. A single seta extending over anterior pit on each femur. Six dorsal notches on all tibiae with two minute setae between the fourth and fifth notches. Four lateral plantar bristles on each of the distitarsomeres. Unmodified abdominal segments: Tergites lacking marginal spinelets. Two rows of setae per tergite. One antesensillar seta per side set on small tubercle. Patch of 12–13 small setae on st. II isolated from single basal seta per side. Sternum III with 6–7 setae per side, preceded by 5–6 scattered setae. Sternites IV–VI with 4–5, 3, and 4 per side, respectively. Modified abdominal segments: Tergum VIII with 5–7 setae per side dorsal to atrium of spiracle. Atrium with obvious expansion at base. Caudal margin of t. VIII rounded with 8 marginal setae, patch of 6 setae anterior to these, and 10–12 short, stout setae mesally at apex. Caudal margin of st. VII entire (Fig. 1J). Sternum VIII broad and obliquely rounded dorsally. Sides of anal stylet parallel, four times as long as wide, bearing one long seta and 2 minute setae ventral to base of long seta. Ventral anal lobe convexly arched ventrally with numerous stout marginal setae. Spermatheca slightly askew but cribriform area appears to extend from surface to deep within bulga. Perula of bursa copulatrix spherical, not ovoid (Fig. 1I).

Length (single slide mounted specimen).—2.5 mm

Polygenis (Polygenis) litargus (Jordan and Rothschild, 1923)

Specimens Examined.—**Hauzlas Province:** Santa River Valley, Choquechaca (N of Caraz), 2195 m, ex *O. xantholus*, 2–3 September 1999, USUHS Team, 3♂, 4♀; ex *A. mollis*, 3–4 September 1999, USUHS Team, 2♀; ex *P. andium*, 2 September 1999, USUHS Team, 1♂; ex *Thomasomys* sp., 4 September 1999, USUHS Team, 1♂.

Remarks.—This flea was collected from inside a human dwelling from a water trap and from sylvatic rodents. Macchiavello (1957) reported that *P. litargus* was the principal vector of plague among *Sciurus stramineus* Eydoux and Souleyet, 1841 in Lancones and Cazaderos, Piura Department, Peru. This flea should be considered a potential link in transferring plague from wild rodent populations to commensal, or peridomestic rodents such as *O. xantholus*.

Tetrapsyllus (Phylliver) bleptus (Jordan and Rothschild, 1923)

Specimens Examined.—**Huaraz Province:** Pariacota (9°33'27"S, 77°38'82"W), 3630 m, ex *P. andium*, 24 March 2000, Hastriter Team, 3♀; Pariacota (9°33'10"S, 77°35'69"W), 3715 m, ex *P. andium*, 24 March 2000, Hastriter Team, 1♀.

Remarks.—Females of this species were collected from two adjacent sites from three specimens of the same host species, *P. andium*. Known only from high elevations (2745–4880 m), it has previously been reported from Junin Department, Peru, south to Parincota Province, Chile and Catamarca (type locality) and Jujuy Provinces, Argentina. Records from Ancash Department establish the most northern account for *T. bleptus*.

Tiasmastus cavicola (Weyenbergh, 1881)

Specimens Examined.—**Hauzlas Province:** Santa River Valley, Choquechaca (N of Caraz), ex *C. porcellus*, January 2000, P. Lima, 5♂, 20♀.

Remarks.—This flea is common on the domestic guinea pig, which is a staple food source for the indigenous people of Peru. Little effort was expended in collecting fleas from these hosts or in human habitations, although they are known to occur in large numbers on *C. porcellus*.

Stephanocircidae

Cleopsylla townsendi Rothschild, 1914

Specimens Examined.—**Chiquian Province:** E of Chiquian (10°03'48"S, 77°19'27"W), 4180 m, ex *P. amicus*, 27 March 2000, Hastriter Team, 1♂ 2♀; E of Chiquian (10°06'07"S, 77°11'07"W), 4180 m, ex *Akodon* sp2 cf. *mollis*, 27 March 2000, Hastriter Team, 4♂ 1♀; E of Chiquian (10°08'06"S, 77°10'22"W), ~3995 m, ex *P. andium*, 27 March 2000, Hastriter Team, 1♀; E of Chiquian (10°09'14"S, 77°19'17"W), 3990 m, ex *P. andium*, 27 March 2000, Hastriter Team, 1♂, 2♀. **Huaraz Province:** Pariacota (9°33'10"S, 77°35'69"W), 3715 m, ex *P. andium*, 24 March 2000, Hastriter Team, 4♂. **Huaylas Province:** Parque Nacional Huascarán (9°30'04"S, 77°25'31"W), 3630 m, ex *Akodon* sp1 cf. *mollis*, 25 March 2000, Hastriter Team, 1♂; Parque Nacional Huascarán (9°30'27"S, 77°26'13"W), 3935 m, ex *Akodon* sp1 cf. *mollis*, 25 March 2000, Hastriter Team, 2♂, 4♀; Parque Nacional Huascarán (9°30'39"S, 77°27'69"W), 3475 m, ex *P. andium*, 25 March 2000, Hastriter Team, 1♂, 2♀; and Parque Nacional Huascarán (9°30'04"S, 77°25'31"W), 3630 m, ex *Akodon* sp2 cf. *mollis*, 25 March 2000, Hastriter Team, 1♀. **Recuay Province:** 4.6 km W Recuay (9°43'36"S, 77°27'55"W), ~3660 m, ex *P. andium*, 29 March 2000, Hastriter Team, 2♀; 19 km W Recuay (9°44'6"S, 77°30'03"W), 4420 m, ex *Akodon* sp1 cf. *mollis*, 29 March 2000, Hastriter Team, 1♀; N of Santos River (10°03'48"S, 77°19'27"W), 4180 m, ex *P. amicus*, 27 March 2000, Hastriter Team, 1♂, 2♀.

Remarks.—The bulga of the spermatheca of *C. townsendi* extends well onto

the hilla, giving the false impression that the hilla is extended into the bulga. This is not apparent in figures of the spermatheca illustrated by Hopkins and Rothschild (1956) and Johnson (1957). The species has been reported from Chimborazo, Ecuador (type locality) and Parincota, Chile, and in four Peruvian Departments (Table 1). It was commonly collected on species of *Phyllotis* and *Akodon* in Ancash Department, although it has been reported from a variety of hosts in other high elevation regions (3660–4880 m).

Craneopsylla minerva minerva (Rothschild, 1903)

Specimens Examined.—**Hauzlas Province:** Santa River Valley, Choquechaca (N of Caraz), ex *P. andium*, 2 September 1999, USUHS Team, 1♂. **Huaraz Province:** Pariacota (9°32'32"S, 77°47'50"W), 1860 m, ex *P. andium*, 23 March 2000, Hastriter Team, 1♀. **Huari Province:** Yungilla, ex *Rattus* "silvestre", 15 April 1999, J. Cisamaro, 1♀. **Huaylas Province:** Parque Nacional Huascarán (9°30'40"S, 77°28'32"W), 3385 m, ex *P. amicus*, 25 March 2000, Hastriter Team, 1♀; Parque Nacional Huascarán (9°30'40"S, 77°28'32"W), 3380 m, ex *Akodon* sp2 cf. *mollis*, 25 March 2000, Hastriter Team, 1♂, 2♀; Parque Nacional Huascarán (9°30'39"S, 77°28'69"W), 3475 m, ex *Akodon* sp1 cf. *mollis*, 25 March 2000, Hastriter Team, 3♂, 1♀. **Recuay Province:** 10 km W Recuay (9°43'25"S, 77°29'13"W), 4010 m, ex *P. andium*, 29 March 2000, Hastriter Team, 1♂, 2♀; 10 km W Recuay (9°43'25"S, 77°29'13"W), 4010 m, ex *P. amicus*, 29 March 2000, Hastriter Team, 2♂, 1♀.

Remarks.—Specimens of *Craneopsylla minerva wolffhuegeli* (Rothschild, 1909) referenced by Macchiavello (1948) from Ecuador, Peru and northern Chile, undoubtedly belong to the nominate subspecies. Although the two subspecies are sympatric in northern Argentina, *C. m. wolffhuegeli* probably does not occur in Peru. Neither species have been reported in Bolivia.

Plocopsylla achilles (Rothschild, 1911)

Specimens Examined.—**Chiquian Province:** E of Chiquian (10°9'54"S, 77°19'42"W), 3900 m, ex *Akodon* sp1 cf. *mollis*, 27 March 2000, Hastriter Team, 1♂, 1♀. **Huaylas Province:** Parque Nacional Huascarán (9°30'27"S, 77°26'13"W), 3935 m, ex *Akodon* sp1 cf. *mollis*, 25 March 2000, Hastriter Team, 2♂, 1♀; Parque Nacional Huascarán (9°30'04"S, 77°25'31"W), 3630 m, ex *Akodon* sp1 cf. *mollis*, 25 March 2000, Hastriter Team, 1♀. **Recuay Province:** 10 km W Recuay (9°43'25"S, 77°29'13"W), 4010 m, ex *P. andium*, 29 March 2000, Hastriter Team, 1♂; 19 km W Recuay (9°44'06"S, 77°30'03"W), 4420 m, ex *Akodon* sp1 cf. *mollis*, 29 March 2000, Hastriter Team, 2♂, 4♀.

Plocopsylla pallas (Rothschild, 1914), male description
(Fig. 2B–H)

Material Examined.—**Huaraz Province:** Pariacota (9°33'10"S, 77°35'69"W), 3715 m, ex *P. andium*, 24 March 2000, Hastriter Team, 1♂; Pariacota (9°33'27"S, 77°38'82"W), 3630 m, ex *P. andium*, 24 March 2000, Hastriter Team, 5♂, 7♀. **Recuay Province:** N of Santos River (10°03'48"S, 77°19'27"W), 4180 m, ex *P. amicus*, 27 March 2000, Hastriter Team, 2♀; road cut on highway 109 between Chiquian junction and Pavilotica (10°9'36"S, 77°19'46"W), 3980 m, ex "Berlese nest from cavity in earth bank," 1 April 2000, M.W. Hastriter and R. Soto, 1♂; N of highway 109 between Chiquian junction and Pavilotica (10°09'14"S, 77°19'17"W), 3990 m, ex *Akodon* sp2 cf. *mollis*, 28 March 2000, Hastriter Team, 1♂; N of highway 109 between Chiquian junction and Pavilotica (10°9'14"S, 77°19'17"W), 3990 m, ex *P. andium*, 28 March 2000, Hastriter Team, 1♂, 8♀; 10 km W Recuay (9°43'25"S, 77°29'13"W), 4010 m, ex *P. andium*, 29 March 2000, Hastriter Team, 10♂, 12♀; 10 km W Recuay (9°43'25"S, 77°29'13"W), 4010 m, ex *P. amicus*, 29 March 2000, Hastriter Team, 3♂, 5♀. Specimens of this series are deposited in the CMNH (2♂, 2♀), the National Museum of Natural History, Washington, D.C. (2♂, 2♀), and the Robert E. Lewis collection (2♂, 2♀). The remaining specimens remain in the senior author's collection.

Remarks.—In his original description of *P. pallas*, Rothschild (1914) provided only a brief description based on two females collected from a "rat" in Junin

Department. His description of the female is herein supplemented (based on 34 ♀) and a description of the male is provided for the first time based on a large series of 22 ♂. Our records would indicate that *P. andium* is the preferred host. This flea was not collected in other provinces (also high altitude sites), although *P. andium* was prevalent.

Diagnosis.—Both sexes resemble *P. viracocha* Schramm and Lewis, 1987 and *P. enderleini* Wagner, 1933 by the lack of basally notched helmet spines and a genal comb consisting of 6 spines (the genal spine being smaller than the others and separated by a space roughly the width of the spines). Schramm and Lewis (1988) assigned these two species to Species Group A, Subgroup A-3. The males of *P. pallas* can now be assigned to this grouping. The male can immediately be distinguished from those of *P. viracocha* by the presence of a slender mesal lobe projecting well beyond the dorsal margin of the basimere (Fig. 2E) and the apex of st. IX bent caudad at a 90° angle (Fig. 2D). The absence of an acutely angled dorso-anterior projection of the telomere (Fig. 2E–F) separates it from *P. enderleini*. Separable from males of both species by the presence of a conspicuous dorsally expanded wing-like sclerite that extends upwards between t. VII and sensillum (Fig. 2B). Females may be separated from *P. enderleini* in having a prectenidial helmet width that is more than one and one-half the length of the longest helmet spine and from *P. enderleini* (5–6 well-separated bristles) and *P. viracocha* (4 well-separated bristles) in having only 3 well-separated marginal bristles below the lobe of t. VIII.

Description, Male.—Head: Anterior helmet consisting of 14 spatulate spines without notched bases. Prectenidial width of helmet more than 1.5 times length of longest helmet spine. Line of minute marginal setae along anterior margin of helmet; single large seta near base of ventral-most helmet spine. Two placoid pits along dorsal margin of helmet. Helmet striations absent above dorsal spine. Gena with 8–9 minute setae along anterior margin; two large lateral setae in vertical row. Genal comb of 6 spatulate spines; dorsal-most spine less than ½ length of others. Genal lobe extending beyond dorsal genal spine and truncate. Maxillary palpus of 5 segments; basal segment very short. Maxilla slightly rounded apically; labial palpus of 5 segments, apex reaching ⅔ length of fore coxa. Postantennal region with anterior group of 18–20 setae per side and 4 rows (4, 5, 8 and 8–9 setae per side); posterior row with intercalaries. Occiput with dorsal tuber. Antennal scape with 5 apical setae extending onto pedicel; pedicel with 10 long slender setae extending beyond 9-segmented clavus. The latter appears compressed and fused, extending far short of antennal fossa. Thorax (Fig. 2A): Pronotum with two anterior irregular rows of setae and a third posterior row; comb composed of 22 spines. Large dorsal notch in prosternum for cervical link plate. Mesonotum with anterior group of setae; posterior row of 6 setae per side with intercalaries and single pseudoseta per side under mesonotal collar. Metapleuron with 9 lateral setae. Mesosternum lobed ventrally downward between pro- and mesocoxae. Metanotum with irregularly arranged anterior row of setae and posterior row of 6 setae per side with intercalaries. The dorso-posterior margin of metanotum barely discernible. Lateral metanotal area with 3 setae. Pleural arch well developed. Metepisternum with single lateral seta; squamulum present. Metasternum lobed antero-ventrally extending downward between mid and hind coxae. Metepimeron with two vertical rows of 4 setae each; atrium of spiracle larger than abdominal spiracles. Legs: Numerous lateral setae on fore coxa. Fore femur with 9–10 lateral setae, no mesal setae. Setae guarding femoral-tibial joint subequal. Dorsal margin of fore tibia with 5 notches bearing setae (2, 2, 3, 3, 3), apical setae arranged in a false comb of 7 setae. Lateral surface of fore tibia with vertical row of 7 setae. Lateral sulcus of mid coxa complete. Anterior femoral pit of mid femur with long outer seta and shorter inner seta; 6 setae each on posterior lateral margin and single mesal seta. Lateral seta guarding femoral-tibial joint of mid femur larger than mesal seta; mesal seta larger than lateral seta on hind femur. Hind tibia with 10 lateral setae, 6 dorsal notches (2, 2, 3, 3, 3, 3 setae), and apical false comb of 9–10 setae. Mid and hind coxae, each with fringe of setae extending about ⅓ from apex to base. Dorsal margin of mid and hind femora with short, stout setae. Hind femur with 8–9 lateral setae arranged toward posterior. Hind tibia with 15 lateral setae, 7 dorsal notches (2, 2, 3, 3, 3, 3, and 4 setae); apical setae interrupted and not forming a false comb as on fore and mid tibiae. The lowest seta in each notch bearing 3 setae separated from adjacent 2 setae by space less than width

Table 1.—A listing of fleas of Peru by political departments (A = new record for Ancash Department; C = species found in current study; P = new record for Peru; X = species recorded in literature; and ? = doubtful occurrence).

Flea species	Ancash	Apurimac	Arequipa	Ayacucho	Caja-marca	Cuzco	Huan-cavelica
<i>Adoratopsylla intermedia coph</i>							
<i>Adoratopsylla intermedia intermedia</i>							
<i>Agastopsylla hirsutior</i>							
<i>Agastopsylla nilotica nilotica</i>							
<i>Agastopsylla pearsoni</i>							
<i>Ayshaepsylla thurmani</i>	AC						
<i>Cediopsylla spillmanni</i>							
<i>Ceratophyllus titicacensis</i>							
<i>Cleopsylla townsendi</i>	AC					X	
<i>Craneopsylla minerva minerva</i>	AC						
<i>Craneopsylla minerva wolffhuegeli?</i>			X				
<i>Ctenidiosomus spillmanni</i>							
<i>Ctenocephalides canis</i>	X				X		
<i>Ctenocephalides felis felis</i>	CX						
<i>Dasypsyllus plumosissimus</i>						X	
<i>Dasypsyllus stejnegeri</i>	PC						
<i>Delostichus phyllotis</i>			X				
<i>Delostichus xenurus</i>	X						
<i>Echidnophaga gallinacea</i>	AC						
<i>Ectinorus alejoi</i> n. sp.	PC						
<i>Ectinorus claviger</i>	AC			X			
<i>Ectinorus disjugis</i>			X				
<i>Ectinorus hecate</i>			X				
<i>Ectinorus hertigi</i>							
<i>Ectinorus ineptus</i>							
<i>Ectinorus pearsoni</i>							
<i>Ectinorus sentus</i>							
<i>Ectinorus simonsi</i>			X				
<i>Ectinorus viscachae</i>				X			
<i>Euhoplopsyllus andensis</i>							
<i>Euhoplopsyllus manconis</i>							
<i>Gephyropsylla klagesi klagesi</i>							
<i>Gephyropsylla klagesi samuelis</i>							
<i>Hectopsylla eskeyi</i>			X				
<i>Hectopsylla psittaci</i>							
<i>Hectopsylla pulex</i>						X	
<i>Hectopsylla suarezi</i>	CX						
<i>Hormopsylla egena</i>							
<i>Hormopsylla trux</i>							
<i>Leptopsylla segnis</i>	CX						
<i>Myodopsylla setosa</i>						X	
<i>Neotyphloceras crassispina chilensis?</i>							
<i>Neotyphloceras crassispina crassispina</i>	X	X					
<i>Neotyphloceras crassispina hemisus</i>	AC						
<i>Neotyphloceras rosenbergi</i>					X		
<i>Nonnapsylla rothchildi</i>							
<i>Nosopsyllus fasciatus</i>							
<i>Nosopsyllus londiniensis londiniensis</i>					X		
<i>Parapsyllus cedei</i>							
<i>Plocopsylla achilles</i>	CP						
<i>Plocopsylla endertieini</i>			X				
<i>Plocopsylla hector</i>							
<i>Plocopsylla inti</i>							
<i>Plocopsylla kilya</i>							

Table 1.—Continued.

Flea species	Ancash	Apurimac	Arequipa	Ayacucho	Cajamarca	Cuzco	Huan-cavelica
<i>Plocopsylla pallas</i>	AC						
<i>Plocopsylla viracocha</i>							X
<i>Plusaetis equatoris?</i>							
<i>Plusaetis dolens quitanus</i>	AC						
<i>Polygenis bohlsi bohlsi</i>							
<i>Polygenis brachinus</i>					X		
<i>Polygenis impavidus</i>						X	
<i>Polygenis litargus</i>	CX				X		
<i>Polygenis litus?</i>							
<i>Polygenis rimatus?</i>	X						
<i>Polygenis roberti beebei</i>		X					X
<i>Polygenis roberti roberti</i>							X
<i>Pulex irritans</i>	CX				X		
<i>Rhopalopsyllus australis tupinus</i>							
<i>Rhopalopsyllus cacicus</i>							
<i>Rhopalopsyllus lugubris lugubris</i>							
<i>Sphinctopsylla inca</i>	AC						
<i>Sternopsylla distincta speciosa</i>						X	
<i>Tetrapsyllus bleptus</i>	AC						
<i>Tetrapsyllus comis</i>							
<i>Tetrapsyllus elutus</i>							
<i>Tetrapsyllus tristis</i>							
<i>Tiamastus cavicola</i>	CX		X		X		
<i>Tiarapsylla bella</i>							
<i>Tiarapsylla titschacki</i>	AC						
<i>Tunga penetrans</i>	CX				X		
<i>Xenopsylla cheopis</i>					X		

of base of same setae. Femoral pits on all three femora with long outer seta and shorter inner seta. The fifth segment of each tarsus with 5 pairs of plantar bristles, the proximal pair placed on plantar surface between second pair, preapical plantar bristles small, paired, and broadly spaced on apex of plantar surface. Unmodified abdominal segments: Number of marginal spinelets variable on t. I–VII (5–6, 3–4, 4, 2–3, 0, 0, and 0 spinelets per side). Tergites I–VI with 2 rows of setae (anterior short setae, posterior long setae with intercalaries). Tergum VII with single row of setae, antesensilial bristles lacking. Single seta of main row below level of pointed spiracular fossa. Notable sclerotized apodemes on basal st. II, bearing single seta per side, st. III–VI with 3 setae per side, st. VII with 1–2 small setae per side. Modified abdominal segments (Fig. 2B, D–F): Tergum VIII greatly expanded into wing-like processes that extend dorsad between t. VII and sensilium, mesal surface spiculose (Fig. 2B). Basimere of t. IX with mesal process along dorsal margin bearing 2 setae, apex with row of 8–9 long marginal setae (Fig. 2E). Apex of telomere nearly twice as wide as near point of articulation with basimere; bearing a scattered group of minute setae on the mesal surface and a large spiniform on the apical-posterior mesal surface. Membranous dorsal anal lobe with single dorsal seta; ventral anal lobe with two ventral setae. Sensilium with 16 sensilial pits per side. Sternum VII extending upward covering st. VIII and aedeagus. Apex of st. IX strongly bent caudad, bearing a single hair-like seta and two highly modified spiniform bristles (Fig. 2D). Aedeagus (Fig. 2C): Lateral lamina narrow at neck broadening toward apex; median lamina broader than lateral lamina. Lateral lamina projecting dorso-caudadly above fulcrum. Apodemal rod extending from well differentiated ventral floor of the girdle. Penis rods slightly longer than lateral/median lamina. Dorsal median lobes membranous and somewhat squared apically with sclerotized crochet. Sclerotized inner tube covered laterally by dorsal armature. Modified abdominal segments, female (Fig. 2G–H): Dorsal portion of t. VIII with two stout setae just above spiracular fossa; dorsal margin beneath sensilium strongly concave with well developed lobe along upper caudal margin lacking setae. The dorsal caudal lobe subtended by a shallow sinus with three long marginal bristles equally spaced; anterior and nearly contiguous to these is a shorter subspiniform seta extending obliquely upward. Among a lateral group of 36–38 setae are 2 stout setae. Caudal margin of st. VII with slight concavity, group of 16–18 setae per side of which 2

Table 1.—Continued. Extended.

Ica	Junín	La Libertad	Lambayeque	Lima	Loreta	Moquegua	Pasco	Piura	Puno	San Martín	Tacna	Tambo	Tumbes	Peru Islands
	X								X					
								X						
								X						
	X							X						
X	X	X	X					X	X				X	X
								X						
X		X	X	X				X					X	
	X							X						
	X			X				X						
								X						
	X							X	X					
X		X	X	X		X		X					X	
	X	X							X					
X		X	X	X				X						
		X	X	X				X					X	

are strongly curved ventrad (Fig. 2 H). Sternum VIII without setae. Dorsal anal lobe dorsally enclosed with fringe of 7–8 long setae; anal stylet more than three times as long as wide with 2 short and 1 long setae. Ventral anal lobe inconspicuous with several fine setae along ventral portion. Bulga of spermatheca about twice length of hilla; lumen deeply inserted into bulga and distinctly narrowed at apex of internal orifice. Spermatheca strongly concave ventrally and convex dorsally; lumen of duct enters bulga ventrally (Fig. 2G).

Length (slide mounted specimens).—Male: 2.9 mm (n=20, range=2.6–3.1 mm); Female: 2.9 mm (n=20, range=2.4–3.2 mm).

Sphinctosylla inca (Rothschild, 1914)

Specimens Examined.—**Chiquian Province:** E of Chiquian (10°08'06"S, 77°10'22"W), ~3660 m, ex *P. andium*, 27 March 2000, Hastriter Team, 1♀. **Huaylas Province:** Parque Nacional Huascarán (9°30'04"S, 77°25'31"W), 3630 m, ex *Akodon* sp1 cf. *mollis*, 25 March 2000, Hastriter Team, 2♀; Parque Nacional Huascarán (9°30'27"S, 77°26'13"W), 3630 m, ex *Akodon* sp1 cf. *mollis*, 25 March 2000, Hastriter Team, 1♂.

Tiarapsylla titschacki Wagner, 1937

Specimens Examined.—**Recuay Province:** W of junction highways 3 and 109 (~10°03'S, 77°22'W), ~4115 m, ex *L. peruanum*, 29 March 2000, T. Alejo, 3♂, 7♀.

Remarks.—Three type specimens (1♂, 2♀) were collected on “vizcacha” in the adjacent Department of La Libertad (4000 m) (Wagner, 1937). Additional records include one female each from *L. peruanum*, Department of Puno (ele-

vation unknown) and Department of Junin (~4875 m) (Johnson, 1956). A female was also reported from a feline host in the Department of Puno (Hopkins and Rothschild, 1956). The latter record is undoubtedly a predator-related association. *Lagidium puruanum* seems a preferred host for this species, occurring only at high elevations from central to southern Peru.

DISCUSSION

Very common species (*Pulex irritans* complex, *L. segnis*, *E. gallinacea* and *T. cavicola*) found on peridomestic animals were not aggressively sought except to establish records for Ancash Department. Trapping statistics were kept only for the March 2000 collecting period and an analysis follows. During eight trap nights, 844 traps were set yielding 67 small mammals [*Akodon* sp1 cf. *mollis* (n=16, 23.9%), *Akodon* sp2 cf. *mollis* (n=5, 7.5%), *M. musculus* (n=5, 7.5%), *P. andium* (n=38, 56.7%) and *P. amicus* (n=3, 4.5%)] for a catch rate of 7.9%. *Phyllotis andium* harbored 57% of the total fleas collected. *Plocopsylla pallas* was found on 13 of the 38 (34%) *P. andium* surveyed. The average number of *P. pallas* occurring on *P. andium* that were positive for this flea was 3.4. *Phyllotis andium* was trapped at the same locations as *P. amicus* and *Akodon* sp2 cf. *mollis*, but *P. pallas* was found only once on each of these hosts. One can only speculate as to why *P. pallas* was not collected in provinces other than Recuay, since *P. andium* was present in all provinces at similar elevations and habitats. Fleas most commonly collected on sylvatic mammals during all collection periods included the following: *Plocopsylla pallas* (16%), *Neotyphloceras crassispina hemisus* (14%), and *Cleopsylla townsendi* (9%). These three species comprised 39% of the total number of fleas collected.

The total number of species of fleas currently reported in Peru is 81 (Table 1); however, this may be misleading. Several species listed in Table 1 are probable misidentifications. They include the following: *C. m. wolffhuegeli*, *N. c. chilensis*, *P. equitoris*, *Polygenis rimatus* (Jordan, 1932), and *Polygenis litus* (Jordan and Rothschild, 1908). The latter species reported from Piura Department by Macchiavello (1948) is doubtful, since only three females (localities unknown) of *P. litus* have been reported in the literature (Jordan and Rothschild, 1908, 1923) and can easily be confused with *P. litargus*. Populations of *C. m. wolffhuegeli* flourish much farther south in northern Argentina and southern Bolivia. *Neotyphloceras c. chilensis*, difficult to distinguish from other subspecies, occurs along montane and coastal Chile from Santiago south. *Plusaetis equatoris* may be found in the Andean valleys of northwestern South America as far south as Ecuador. The latter three species probably represent *C. m. minerva*, *N. c. crassispina* or *N. c. hemisus*, and *P. d. quitanus*, respectively. Literature records of *P. rimatus* were reported on the same hosts (*O. xantheolus* and *A. mollis*) on which we found *P. litargus* and likely represents this species. *Polygenis rimatus* is common in lowland areas of Argentina, Brazil, and Paraguay, but not in montane regions. Considering these five species as extralimital to Peru, the total number of recognized taxa that occur in Peru is 76.

The distribution of several species reported in the literature are of special interest. Populations of *Gephyropsylla klagesi samuelis* (Jordan and Rothschild, 1923) and *P. litargus* on the Isla Metapalo (Table 1, Peru Islands) were possibly transported by commerce on their common peridomestic host, *O. xantheolus*, or associated commensal rodents. Although both subspecies of *Adoratopsylla inter-*

media have been reported in Junin and Piura Departments, neither were collected during our studies. This species is harbored by various marsupial species of *Didelphis* Linnaeus, 1758 and *Monodelphis* Burnett, 1830. The distribution of these hosts in diverse habitats throughout the Andean valleys and the lowlands of Peru should support a much broader distribution than the records would indicate for this flea species. We were surprised that *Neotyphloceras rosenbergi* (Rothschild, 1904) was not collected, since it was reported in the departments of Cajamarca and Piura from hosts we commonly collected (*A. mollis* and *O. xantheolus*). Three fleas are reported from Peru for the first time (*D. stejnegeri*, *P. achilles*, and *E. alejoi* n. sp.). Eleven of the 21 species herein reported are new records for Ancash Department (*A. thurmani*, *C. townsendi*, *C. m. minerva*, *E. gallinacea*, *E. claviger*, *N. c. hemisus*, *P. pallas*, *P. d. quitanus*, *S. inca*, *T. bleptus*, and *T. titschacki*).

Future emphasis for flea faunal studies should include departments that have received little attention. Most notably are the departments of the eastern slope of the Andes (Amazonas, Cuzco, Huanuco, Junin, Pasco, and San Martin), the lowland departments (Loreto and Madres de Dios), the southern coastal departments (Arequipa, Moquegua, and Tacna), and the south central montane departments (Apurimac, Ayacucho, Huancavelica).

ACKNOWLEDGMENTS

Grateful appreciation is extended to Dr. Paul Pachas Chavez and Dr. Carlos Enrique Ponce Garcia, Ministerio de Salud, Hospital de Caraz, and Jorge Lucero Tamayo, Ministerio de Salud, Laboratorio Referencial Regional de Salud, Huaraz for providing coordination and facilities support for part of this research. For the loan of specimens we are grateful to Theresa Howard and the Trustees of the Natural History Museum, London. The logistical support and assistance of Pat Carney, Uniformed Services University of the Health Sciences, Bethesda, MD, and the staff of the U.S. Naval Medical Research Center Detachment Unit 3800, Lima, Peru, were also essential to these studies, and we are much indebted. To Dr. Oswaldo Ramirez, Universidad Peruana Cayetano Heredia, Lima, we acknowledge support in identifying the host mammals. The senior author expresses special thanks to the staff of the Monte L. Bean Life Science Museum for their continued support in providing work space, equipment and materials necessary for conducting systematic studies. Funding for this research was partially provided by a grant from the National Science Foundation, Award Number DEB-9983195.

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